87-e32

Segment No. 25-00-02

WA-12-1110

CHAMBERS CREEK WASTEWATER TREATMENT PLANT CLASS II INSPECTION, FEBRUARY 17-18, 1987

by

Don Reif

Washington State Department of Ecology
Water Quality Investigations Section
Olympia, Washington 98504-6811

September 1987

ABSTRACT

A Class II inspection was conducted at the Chambers Creek Wastewater Treatment Plant on February 17 and 18, 1987. The complete-mix activated sludge plant was operating very well with no NPDES permit violations observed during the inspection, although a chronic problem with partial nitrification was apparent. The laboratory procedures review and split sample results indicated good adherence to analytical protocols. Two of three effluent bioassays showed significant toxic effects. Recommendations include a follow-up investigation into the cause of the effluent toxicity, a permit modification from regular BOD to carbonaceous BOD, and two laboratory procedures adjustments.

INTRODUCTION

A Class II inspection was conducted at the Chambers Creek Wastewater Treatment Plant on February 17 and 18, 1987. The inspection was requested by Darrel Anderson of Ecology's Southwest Regional Office. Conducting the inspection were Marc Heffner and Don Reif of the Water Quality Investigations Section. Assisting from Chambers Creek was Larry McCaffrey, plant superintendent; Jim Landen, head operator; Tom Davies, shift operator; and Steve Thompson, laboratory manager.

The objectives were:

1. Collect samples and measure flows to estimate plant loading and efficiency.

2. Split samples with the plant lab and perform a laboratory evaluation.

3. Determine NPDES permit compliance during the inspection.

4. Investigate effluent toxicity using bioassays.

5. Characterize plant operation prior to expansion.

A concomitant receiving water survey was also conducted (Determan, 1987).

LOCATION AND DESCRIPTION

The Chambers Creek Wastewater Treatment Plant is a 12 MGD activated sludge facility serving portions of Pierce County, primarily the Chambers Creek and Clover Creek drainages (Figure 1). Treatment begins with coarse screening and grit removal, followed by primary sedimentation and scum removal. Primary effluent undergoes secondary treatment via complete-mix activated sludge and secondary clarification. Secondary effluent is disinfected with chlorine and discharged into Puget Sound through a deep-water diffuser. A schematic of the treatment plant is presented in Figure 2.

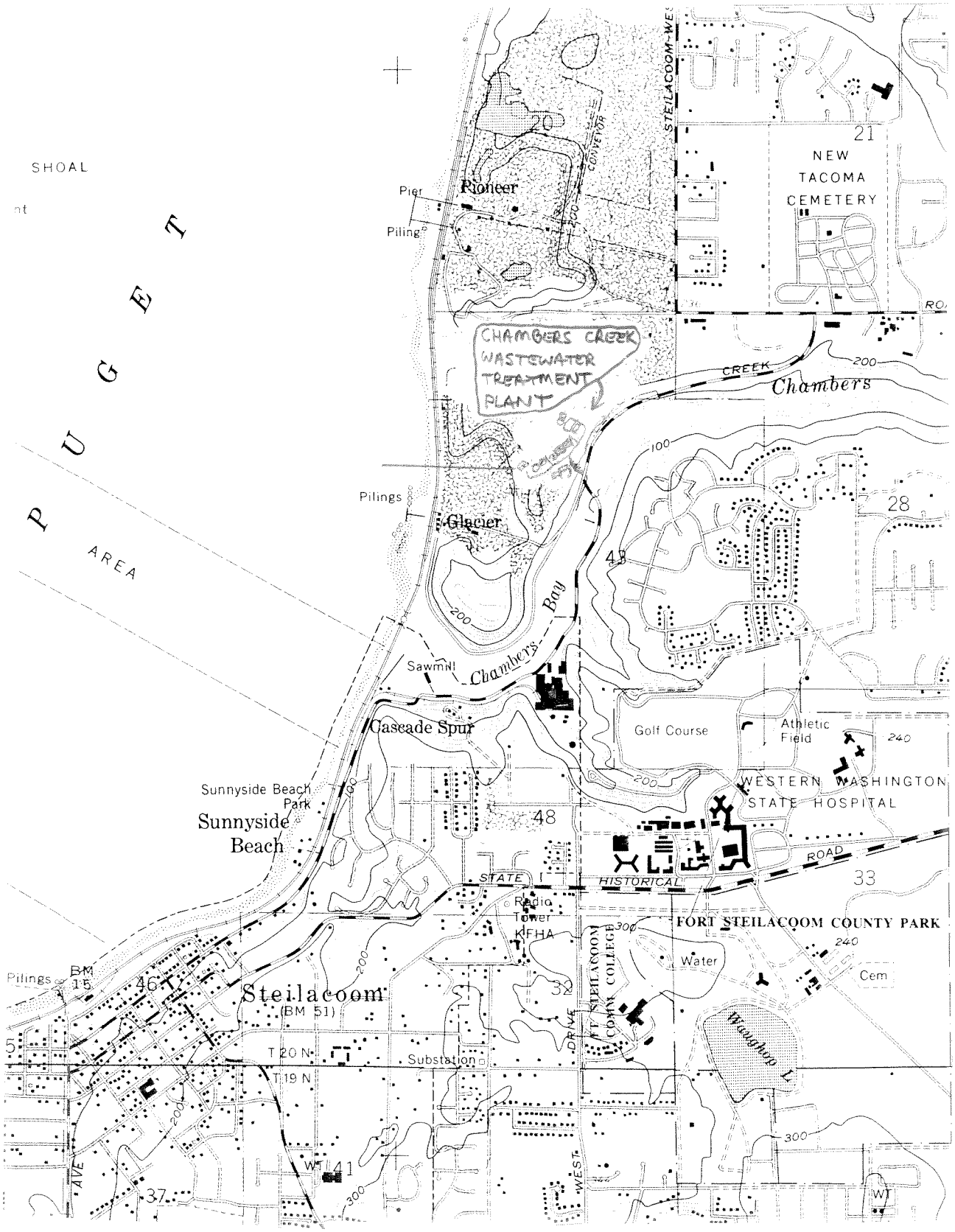
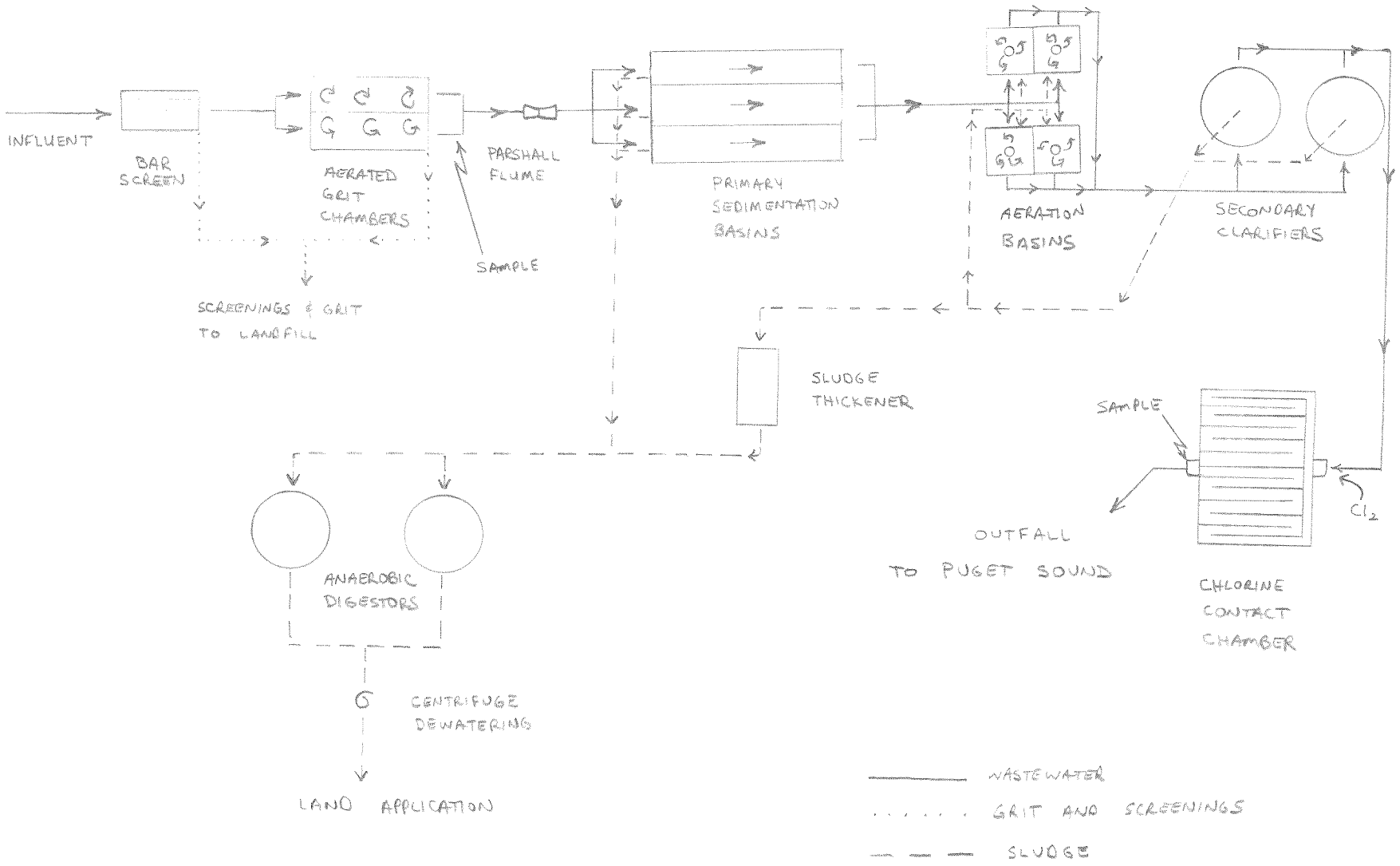


Figure 1. Site Location: Chambers Creek Wastewater Treatment Plant.

Figure 2: Treatment process schematic: Chambers Creek Wastewater Treatment Plant.



Secondary sludge is thickened by dissolved air flotation. Thickened secondary sludge and primary sludge are mixed, anaerobically digested, centrifuged, and trucked off-site for land disposal.

The Chambers Creek plant began operating on November 13, 1984, and is currently treating an average flow of 5-6 MGD, about half of its design capacity. Pre-design plans are underway to retrofit and double the capacity to 24 MGD.

The plant treats mainly domestic sewage. Light industry in the service area consists of gas stations, various laboratories, and photographic processors. Pierce County's pretreatment program is nearly completed and will regulate the discharges of these industries. Septic tank pumpage is a major contributor to plant loading.

METHODS

Twenty-four hour composited samples were collected on both influent (after grit removal) and effluent (Figure 2). Approximately 200 mLs of sample were collected at 30-minute intervals. Grab samples were collected from the influent, effluent, mixed liquor, and return sludge waste streams. Both raw and digested sludge samples were analyzed for metals, as per NPDES permit requirements. Also, an EP TOX metals analysis (WDOE 83-13) was run on digested sludge. A listing of samples collected and analyses performed is shown in Table 1.

Bioassays were run on the final effluent and near-field receiving water sediments. A 96-hour juvenile rainbow trout bioassay (65 percent effluent) was run at Ecology's Manchester Laboratory, in accordance with the department's procedure for "Static Acute Fish Toxicity Test" (DOE 80-12). The four-day "chronic" algal growth test with Selenastrum capricornutum was run by EVS Consultants, Vancouver, B.C. Ceriodaphnia dubia, the water flea seven-day chronic bioassay, was run at the USEPA Environmental Research Laboratory (ERL) at Duluth, Minnesota. These latter two tests followed procedures outlined in the EPA manual for chronic bioassays (EPA, 1985b). All effluent bioassay samples were composites from three grabs collected over the 24-hour compositing period. Samples were iced and shipped overnight to the respective labs.

A sediment sample was collected near the outfall diffuser, following procedures listed in "Puget Sound Protocols" (Tetra Tech, 1986). The sample consisted of multiple grabs that were composited, then sieved through 2mm mesh screen on-site. Analysis using Hyalella azteca was performed at the USEPA-ERL at Corvallis, Oregon (Nebeker & Miller, 1987).

Table 1. Ecology sampling schedule, Chambers Creek Class II inspection; February 17-18, 1987.

Station	Date	Time	Field Analysis				Laboratory Analysis																	Bioassays			
			Temperature	pH	Conductivity	Cl_2 Residual	pH	Turbidity	Conductivity	Alkalinity	NH_3	NO_3	NO_2	Solids (4)	TSS	TVSS	BOD_5	BOD_5 (inhibited)	COD	Metals	Fecal Coliform	EP TOX Metals	Percent Solids	Selenastrum	Trout	Ceriodaphnia	Hyalella
Grab																											
Influent	3/17	a.m.	X	X	X		X	X	X	X					X	X			X								
	3/17	p.m.	X	X	X		X	X	X	X					X				X								
	3/18	a.m.	X	X	X		X	X	X	X					X				X								
Effluent	3/17	a.m.	X	X	X	X	X	X	X	X					X				X		X						
	3/17	p.m.	X	X	X	X	X	X	X	X					X				X		X						
	3/18	a.m.	X	X	X	X	X	X	X	X					X				X		X						
RAS	3/17	a.m.	X	X	X										X	X											
Mixed Liquor	3/17	a.m.	X	X	X										X	X			X								
Raw Sludge	3/17	a.m.	X	X	X																		X				
Digested Sludge	3/17	a.m.	X	X	X															X		X	X				
Outfall Sediment	3/18	p.m.																									X
Composite																											
Influent	3/17-3/18	1100-1030	X	X	X		X	X	X	X	X	X	X	X			X		X								
Effluent	3/17-3/18	1030-1030	X	X	X		X	X	X	X	X	X	X	X			X	X	X					X	X	X	X

RESULTS

General Conditions

Ecology sample results are summarized in Table 2. Analysis of nitrogen species was inconclusive. First, virtually no inorganic nitrogen was detected in the influent sample, although 21+ mg/L were present in the effluent. A similar amount should have been present in the influent. Second, the nitrite test was run at six days over the 48-hour holding time limit. Therefore, evaluation of nitrogen species is not possible.

Flow

Plant flow data taken from plant records are listed in Table 3. An average flow rate of 6.12 MGD was recorded during Ecology compositor sampling. This flow is used in all load calculations.

A check of the Parshall flume indicated proper installation and good correlation between staff gage height and flowmeter reading.

Permit Compliance

Chambers Creek plant was operating very well at the time of the inspection. All parameters were well within permitted limits (Table 4). BOD removal was 92 percent, with 94 percent TSS reduction.

Sludge Analysis

The sludge metals results are listed in Table 5. Most total metals were found at low concentrations, as compared to analyses from similar plants (Heffner, 1985). Nickel and zinc exceeded the averages, but were less than plus-one standard deviation, and considerably less than the highest recorded values.

EP toxicity metals analysis indicated that no parameters were close to dangerous waste criteria levels. Chambers Creek's EP TOX sludge analysis included pesticides and herbicides (Appendix I). Low levels of the common herbicides Silvex and 2,4-D were present at concentrations far below dangerous waste criteria levels.

Laboratory Review

The Chambers Creek laboratory appeared to be a well-organized and conscientious operation. Adherence to accepted protocols was very good. Sample splits between the Ecology and Chambers Creek laboratories compared very well (Table 6). An exception was one TSS value by Chambers Creek that may have been an outlier.

Two comments concerning lab procedures and sampling follow.

Table 2. Ecology sample results, Chambers Creek Class II Inspection, February 17-18, 1987.

Station	Sampler	Date	Time	Field Analysis*				Laboratory Analysis*														
				Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Cl2 Residual Free/Total	pH (S.U.)	Conductivity (umhos/cm)	Turbidity (NTU)	Alkalinity (mg/L as $CaCO_3$)	NH_3-N	NO_3-N	NO_2-N+	Solids: Total	Solids: T. Non-Vol.	Solids: Total Suspended	Solids: Total Non-Vol. Susp.	BOD_5	BOD_5 (inhibited)	COD	Fecal Coliforms (#/100 mL)
Grab																						
Influent	Ecology	3/17	1057	14.1	7.4	500		7.5	529	30	190						130				320	
		3/17	1500	14.0	7.5	570		7.3	557	41	200						180				480	
		3/18	1000	14.0	7.5	520		7.5	486	25	270						93				250	
Effluent	Ecology	3/17	1126	13.9	6.9	500	0.0/0.4	7.0	497	5	130						13				66	<10
		3/17	1515	13.9	6.9	490		6.9	464	5	110						9				41	140
		3/18	1015	14.1	6.8	560		7.0	499	4	130						13				55	92
Mixed Liquor	Ecology	3/17	1115														2200	290			2900	
RAS	Ecology	3/17	1117														13,000	1700				
Raw Sludge	Ecology	3/17	1120														28,000					
Dig. Sludge	Ecology	3/17	0830														17,000					
Composite																						
Influent	Ecology	3/17-	1100-	5.9	7.4	520		7.4	518	38	180	<.01	.11	<.01	820	420	180	10	180		810	
	Cham. Cr.	3/18	1030					7.3	517	35	250	<.01	.10	<.01	490	180	160	19	200		420	
Effluent	Ecology	3/17-	1030-	7.2	7.0	510		7.2	496	4	130	17	1.7	4.9	300	180	11	<1	14	7	59	
	Cham. Cr.	3/18	1030					7.4	487	5	130	16	<.01	5.5	570	370	11	<1	25		62	

*Units for all parameters are mg/L unless otherwise noted.
+Exceeded holding time.

Table 3. Plant flow data, Chambers Creek Class II inspection; February 17-18, 1987.

	Flow (MGD)
February 17, 1987 0000 - 2400 hours	6.22
February 18, 1987 0000 - 2400 hours	6.08
1105 hours February 17, 1987, to 1105 hours February 18, 1987	6.12

Table 4. Comparison of inspection results to NPDES permit limits, Chambers Creek Class II inspection; February 17-18, 1987.

Parameter		Effluent Limitations Monthly Average	 Weekly Average	Ecology Inspection Results
BOD_5	mg/L	30	45	14
	lbs/day	3000	4500	715*
	% Removal	85	--	92
SS	mg/L	30	45	11
	lbs/day	3000	4500	561*
	% Removal	85	--	94
Total Chlorine Residual, mg/L		--	0.6	0.4
Fecal Coliform Bacteria #/100 mL		200	400	<10; 140; 92
pH		--	$\geq$ 6.0; $\leq$ 9.0	6.8; 6,9; 6.9

* = lbs/day based on flow of 6.12 MGD.

Table 5. Sludge metals results, Chambers Creek Class II inspection; February 17-18, 1987.

	Metals+, mg/kg dry weight			EP Toxicity Metals, mg/L		
Metal	Ecology Results	Chambers Creek Results	Previous Inspection Average*	Ecology Results	Chambers Creek Results	Dangerous Waste Designation Level
Cadmium	6.6	8	6.9	0.0015	<0.1	≥ 1.0
Chromium	30	38	59.8	<0.001	<0.1	≥ 5.0
Copper	654	627	366	--	<0.1	--
Lead	150	152	224	<0.001	<0.1	≥ 5.0
Nickel	32.5	37	22.4++	--	<0.1	--
Zinc	1620	1764	1160++	--	1.5	--
Arsenic	--	<1	--	0.026	<0.1	5.0
Barium	--	787	--	0.099	0.4	100
Calcium	--	8751	--	--	--	--
Mercury	--	<1	--	<0.00005	<0.1	0.2
Potassium	--	693	--	--	--	--
Selenium	--	<1	--	0.001	<0.1	1.0
Silver	--	72	--	<0.0002	<0.1	5.0
Sodium	--	648	--	--	--	--

*Geometric mean of 28 activated sludge plants (Heffner, 1985).
+Analyzed as "total recoverable."
++Although higher than geometric mean, was within +1 standard deviation.

Table 6. Comparison of Ecology and Chambers Creek laboratories sample splits, Chambers Creek Class II inspection; February 17-18, 1987. Units for all parameters are mg/L unless otherwise noted.

Sample	Laboratory	Sampler	BOD_5	$CBOD_5$	TSS	Fecal Coliform (#/100 mL)
Influent	Ecology	Ecology	180	--	180	--
		Chambers Creek	200	--	160	--
	Chambers Creek	Ecology	171	--	314	--
		Chambers Creek	162	--	162	--
Effluent	Ecology	Ecology	14	7	11	92
		Chambers Creek	25	--	11	--
	Chambers Creek	Ecology	11.7	8.8	11.8	--
		Chambers Creek	16.8	9.9	12.8	<3

First, glass fiber filters for solids analyses should be pre-washed and dried before use, as described in Standard Methods (APHA-AWWA-WPCF, 1985). The weight loss from the initial washing may not be constant between individual filters and different batches of filters. This change should be made, at least for permit-reporting samples.

Second, Chambers Creek's three automatic, continuous-flow compositors should have their influent lines cleaned periodically. If this is not done, erratic analytical results can occur due to excessive microbial growth in the tubing, which could result in lowered BOD, TSS, and nutrient values. Periodic sloughing, another possibility, would have the opposite effect. These problems may best be prevented by routine injection of a chlorine solution, possibly bleach, into the lines--weekly for influent and primary effluent, and monthly for the effluent line.

Bioassays

Results of effluent bioassays are listed in Table 7. The rainbow trout and algal tests indicated the presence of substantial toxicity. No toxicity was apparent in the Ceriodaphnia bioassay.

The cause of this apparent toxicity is unknown. One possibility is chlorine/chloramines from the disinfection system. Chlorine is considered a fast-acting toxicant, with lethal effects occurring within the first 12 hours of exposure (EPA, 1985a). The trout mortalities, however, occurred mostly after the first 24-hour period, suggesting that chlorine was not the cause.

The toxic effects may have been due to ammonia. The "Gold Book" (EPA, 1986) four-day criteria for cold-water species is 1.8 mg/L of ammonia as N. Effluent ammonia concentrations, at 17 mg/L, were about nine times that amount.

Further toxicity testing is strongly recommended to determine the cause of the observed mortalities. An EPA-sponsored set of bioassay tests is scheduled for September 1987.

No toxicity was observed in the sediment bioassay (Table 7). Further information on the bioassay tests is listed in Appendix II.

Carbonaceous BOD

The Chambers Creek plant experiences nitrification (although not required by NPDES permit) in varying degrees, nearly year-round. This process is only partially controllable by plant personnel, despite implementation of known and accepted control strategies. Nitrification is generally considered to be beneficial to the receiving water environment. Partial conversion of ammonia to nitrite and nitrate, however, can cause several undesirable consequences, such as increased chlorine demand, difficult effluent disinfection, poorer effluent quality, and decreased stability of the activated sludge

Table 7. Bioassay results, Chambers Creek Class II inspection; February 17-18, 1987.

Organism	Effect Type	Percent Effluent	Result	
Selenastrum capricornutum	Chronic	100	97% inhibition, as compared to control	
Rainbow Trout (Salmo gairdneri)	Acute	65	97% mortality	
			Adult Mortality	No. of Young/ Female
Ceridaphnia dubia	Chronic/ subchronic	100	10%	21
		30	0	18
		10	0	13
		3	0	11
		1	0	18
Hyalella azteca	Acute	Sediment	3% mortality	

process. Also, BOD results can be deceptively high, as ammonia and nitrifying bacteria exert an oxygen demand during the BOD test (Yake & Morhous, 1979). As a result, the plant can have difficulty meeting effluent BOD permit requirements. For these reasons, a modification of the Chambers Creek permit to limit carbonaceous BOD (CBOD) rather than total BOD should be considered.

CONCLUSIONS AND RECOMMENDATIONS

The Chambers Creek Wastewater Treatment Plant is a well-operated facility. During the inspection, the plant performed very well and no permit violations were noted. Laboratory procedures followed accepted protocols, and samples split with the Ecology lab compared favorably. The following recommendations are made.

1. Glass fiber filters for solids analysis should be pre-washed and dried before use when used for permit-reporting analyses. Also, sampling lines should be cleaned with a chlorine solution, as described in the laboratory section.

2. A permit modification to limit CBOD rather than BOD should be considered for the Chambers Creek Plant.

3. Further examination of effluent toxicity should be made. The effect of chlorine and ammonia should be checked. Priority pollutant scans on the same sample may be useful. The results of the September 1987 EPA bioassays should be considered.

REFERENCES

APHA-AWWA-WPCF, 1985. Standard Methods for the Examination of Water and Wastewater, 16th Edition.

Determan, Timothy A., 1987. Chambers Creek Wastewater Treatment Plant Receiving Water Study. Washington State Department of Ecology. September 1987. 20pp.

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Heffner, M., 1985. Metals Concentrations Found During WDOE Inspections of Municipal Wastewater Treatment Plants. Ecology memorandum to John Bernhardt; April, 11, 1985.

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State of Washington Department of Ecology, 1981. Biological Testing Methods. DOE 80-12; revised July 1981.

State of Washington Department of Ecology, 1982. Chemical Testing Methods for Complying with the State of Washington Dangerous Waste Regulation. WDOE 83-13; March 1982.

Tetra Tech, Inc., 1986. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Final Report #TC-3991-04; March 1986.

Yake, B. and M. Morhous, 1979. Nitrification as a BOD Interference at Burlington STP. Ecology memorandum to John Glynn; May 15, 1979.

APPENDIX I

PIERCE COUNTY

CHAMBERS CREEK WASTEWATER TREATMENT PLANT
10311 Chambers Creek Road, Tacoma, Washington 98467
Telephone: (206) 565-3013

April 28, 1987

Mr. Don Reif
7272 Cleanwater Lane, Lu-11
Olympia, Wa 98504-6811

Dear Mr. Reif:

The following are the laboratory results for the Class II inspection of Chambers Creek WWTP conducted on February 17 and 18, 1987

Plant Influent and Effluent Composite Samples

Sampled from 0800 hr., 2/17, to 0800 hr., 2/18

Parameter	Plant Sampler	W.D.O.E. Sampler
Influent S.S.:	162 mg/L	314 mg/L
Influent S.S. % volatile:	91%	93%
Effluent S.S.:	12.8 mg/L	11.8 mg/L
Effluent S.S. % volatile:	90%	88%
Influent Total BOD_5:	162 mg/L	171 mg/L
Effluent Total BOD_5:	16.8 mg/L	11.7 mg/L
Effluent Carbonaceous BOD_5:	9.9 mg/L	8.8 mg/L

Plant Effluent Grab Samples

Effluent Fecal Colofirm:	2/17 = 43/100 ml 2/18 = <3/100 ml
Effluent pH:	2/17 = 6.7 2/18 = 6.6
Effluent Chlorine Residual:	2/17 = 0.47 mg/L 2/18 = 0.52 mg/L

Dewatered Sludge Analysis	2/17/87
Total Kjeldahl Nitrogen:	73,500 mg/Kg
Ammonia as N:	13,100 mg/Kg
Phosphorus as P:	12,900 mg/Kg
Total Solids:	12.6%
Volatile Solids:	76%

Please see the attached report from Sound Analytical Services, Inc. for analysis of Dewatered Sludge for total metals, pesticides, herbicides, EP toxicity, and halogenated hydrocarbons. The results for halogenated hydrocarbons appeared to be unreasonably high at 217 ppm. Upon receipt of these results, another dewatered sludge sample and a liquid sludge sample were collected and sent to Lauck's Testing Laboratories, Inc. The results from Lauck's analysis are as follows:

(sampled 4/6/87)	Dewatered Sludge	Liquid Sludge
Halogenated Hydrocarbons:	<10 mg/Kg	<10 mg/Kg

The result from Lauck's Laboratories of less than 10 mg/Kg halogenated hydrocarbons is what I would expect for our dewatered sludge and coincides with previous sludge analysis. If you need any additional information, please call me at 206-565-3013.

Sincerely,

Stephen L. Thompson
Laboratory Supervisor

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14 • TACOMA, WASHINGTON 98424 • TELEPHONE (206) 922-2310

Report To: Chambers Creek Treatment Plant Date: March 30, 1987

Report On: Analysis of Sludge Lab No: A 1539-1

Sample: Centrifuged sludge cake
Date: 2-17-87
Time: 0830

ANALYSIS:

	Total Metals,mg/kg	EP Toxicity Metals,mg/l*
Arsenic	< 1	< 0.1
Barium	787	0.4
Cadmium	8	< 0.1
Calcium	8,751	---
Chromium	38	< 0.1
Copper	627	< 0.1
Mercury	< 1	< 0.1
Nickel	37	< 0.1
Potassium	693	---
Selenium	< 1	< 0.1
Silver	72	< 0.1
Sodium	648	---
Zinc	1,764	1.5
Lead	152	< 0.1

Pesticides & Herbicides:

	Total,mg/kg	EP Toxicity,mg/l*
Lindane	< 0.01	< 0.001
Endrin	< 0.01	< 0.001
Methoxychlor	< 0.01	< 0.001
Toxaphene	< 0.1	< 0.01
2,4-D	1.4	0.003
Silvex	1.2	0.001
PCB	< 0.1	-----

Halogenated Hydrocarbons, ppm 217

* Analyzed in accordance with "Test Methods for Evaluating Solid Waste" EPA SW-846 2nd edition, July 1982.

SOUND ANALYTICAL SERVICES

Brent Hepner

BRENT HEPNER

APPENDIX II

E.V.S. Consultants
Environmental Services

2335 Eastlake Avenue East
Seattle, Washington 98102
(206) 328-4188

Our File: 2/192-05
W.O.: 870075

March 11, 1987

Department of Ecology
c/o Merley McCall
Manchester Laboratory
7411 Beach Drive East
Pt. Orchard, WA
98366

Dear Sirs:

Re: Selenastrum capricornutum 96-h Pass/Fail Bioassay

We have completed one (1) Selenastrum capricornutum 96-hour pass/fail bioassay on a Chambers Creek Cl.II chlorinated effluent sample received February 25, 1987.

The sample was tested at a concentration of 100% in accordance with methods outlined in the EPA manual, "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms". (Horning and Weber, 1985).

The results are summarized below for your convenience and are based on the data from the following pages.

Sample I.D.	Date Collected	End Point: Inhibition (%)
Chambers Creek Cl. II Clorinated Effluent	02/18/1987	97

We trust that the above completes our present assignment to your satisfaction. If there are any questions or comments, please do not hesitate to call the undersigned at (604) 986-4331.

Yours truly,

E.V.S. CONSULTANTS

R. Rousseau

Roxanne R. Rousseau, B.Sc.,
Bioassay Supervisor

RRR:arn

cc: Marc Heffner

Data Sheet for Selenastrum capricornutum
96-hour Pass/Fail Bioassay

A) Sample Information

Initial pH (before filtration) = 6.9
Initial pH (after filtration) = 7.4
Final pH (96-hours) = 8.4

Initial Conductivity (umhos) = 300
Final Conductivity (umhos) = 400

B) Cell Counts

Sample Concentration[a] % (vol./vol.)	Growth Response cells/mL x 10⁶)	Percent Inhibition of Growth [I (%)]
0 (control)	4.9 4.9 4.9	0
100	0.19 0.15 0.15	97

Notes

a) Sample contained a small number of indigenous organisms and particulate matter. Filtration through a 0.5 um filter appeared to remove a majority of the 'nuisance parameters'.

b) Cell counts for three replicates per control and sample concentration (100%) at day four.

c) Observations of all counts (hemocytometer) indicated an inhibitive growth response. The percent inhibition, I (%), was calculated as follows:

$I\ (\%) = (C - T/C) \times 100$
T = The mean growth at a given effluent concentration
C = The mean growth in the control flasks.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Environmental Research Laboratory — Corvallis

SUBJECT: Chamber's Creek Sediment Bioassays DATE: March 23, 1987

FROM: Alan Nebeker

TO: Don Reif
Department of Ecology, LU-11
7272 Cleanwater Lane
Olympia, Washington 98504-6811

Enclosed are the results of our 10-day amphipod crustacean Hyalella azteca bioassays with the Chamber's Creek sediment: No toxicity was observed.

Sample Site	Beaker	No. Hyalella alive at 10-day (20/beaker)	Percent Survival	Water pH	Water Conductivity
Chamber's Cr. Cl. II Station #1 (fine sand)	A	19	97%	8.1	7000 µS
	B	20			
	C	19			
Chamber's Cr. Control Cl. II (coarse sand)	A	14	83%*	8.0	7000 µS
	B	17			
	C	19			
Bond's Pond Control (silt-clay)	A	20	100%	7.8	560 µS
	B	20			
	C	20			

* Coarse sand; hard to find small females (3-4 mm long). Should have used larger (5-6 mm) animals).

The test was conducted from 2-23-87 to 3-5-87. Water temperature = 20°C. Photoperiod = 16 hr light. 1000-ml beakers were test containers. 200 ml sediment and 800 ml freshwater (200 mg/l hardness), aerated. 20 animals/beaker, 3 replicates. Hyalella were ~ 2 months old, 3-5 mm long. Sediment was screened through 2-mm mesh in the field (DCR). Native amphipods were present in samples. These were eliminated prior to test start. Animals were fed on days 2, 5, and 8 of test.

cc: Peterson
Gakstatter

BIOMED

RESEARCH LABORATORIES, INC.

March 4,1987

Washington State Department of Ecology
Manchester Lab.
P.O. Box 346
Manchester, WA 98353

ATTN: Merley McCall

SUBJECT: 96 hour fish toxicity test using WDOE sample #087663
BioMed No. 6951

METHODS, RESULTS AND CONCLUSIONS:

The sample was tested for its toxicity to juvenile rainbow trout (Salmo gairdneri). The testing was carried in accordance with the guidelines set forth in the Washington State Department of Ecology General Procedure for Static Bioassay to Evaluate Industrial Effluent Toxicity. The sample was tested in fish at 65% effluent, 35% diluent.

There were twenty-nine mortalities during the test period, which is a 97% mortality rate.

If you have any further questions or comments, please do not hesitate to contact us.

Respectfully submitted;

Steve Lock
Fisheries Biologist

04101622

1115 East Pike Street, Seattle, Washington 98122 (206) 324-0380

State of Washington Department of Ecology

DATA SHEET FOR STATIC BASIC ACUTE FISH TOXICITY TEST*

Industry Toxicant: WDOE/087663
Address: Manchester Lab
Collector: DLR
Date Sample Collected: 2/18/87

Laboratory: BioMed
Analyst: Steven Lock
Beginning Date: 2/24/87 Time: 10:00am
Ending Date: 2/28/87 Time: 11:00am
Test Organism: Rainbow trout Salmo gairdneri
Required Test Temperature Range: 11.5°C-12.5°C

Laboratory Reference Number	Test Container No.	Conc. mg/l	Number of Cumulative Deaths					Dissolved Oxygen (mg/l)					pH 25 C					Temperature (C)					Total Hardness (mg/l as $CaCO_3$)		Total Alkalinity (mg/l as $CaCO_3$)		Conductivity umHOS/cm	
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96	0	96	0	96
	7	—	0	0	0	0	0	12	11	10	10	9	7.1	—	—	—	7.0	12	12	12	12	12	36.3	40.8	36	64.6	58	82
	8	—	0	0	0	0	0	12	11	10	10	9	7.3	—	—	—	7.0	12	12	12	12	12	27.6	39.3	38.6	68	55	87
		—																										
																		~~12~~	~~12~~	~~12~~								
#6951	9	65%	0	1	8	12	15	11	10	9	8	7	7.4	—	—	—	7.5	12	12	12	12	12	65.4	86.7	175.8	260.4	300	350
#6951	10	65%	0	0	4	5	14	11	10	9	8	7	7.1	—	—	—	7.1	12	12	12	12	12	64.6	85.3	170.2	221.4	300	350
~~#6951~~		~~65%~~																										

Sample Description: #087663
Average Weight: 4.27g Mean Length: 7.34cm Longest: 8cm Shortest: 6.4cm Ratio long:short: 4:1
Number of organisms per chamber: 15 fish Ratio of flesh to water: 4.7g/L Comments: BioMed #6951, 65% Effluent
97% toxicity, 29 mortalities 3% surviving

* Method on file with the Department of Ecology: GENERAL PROCEDURE FOR STATIC BASIC ACUTE FISH TOXICITY TEST

DATA VERIFIED BY: Steven A. Lock DATE: 2/28/87

EHW > 10/30

Table 1.

Water Chemistry Means and Ranges

	Initial				Final		
Percent Effluent	pH Range	D.O. X	D.O. Range	Conductivity X	pH Range	D.O. X	D.O. Range
Pacific Woodtreating I							
Lake Superior	7.9-8.1	9.0	8.9-9.1	95	7.8-8.2	7.9	7.7-8.0
1	7.7-8.0	8.6	8.3-8.8	95	8.0-8.1	7.9	7.6-8.1
30	7.7	8.0	-	190	7.9	7.5	-
100	7.4	6.8	-	430	7.7	6.5	-
Pacific Woodtreating II							
Lake Superior	7.9-8.1	9.0	8.9-9.1	95	7.8-8.1	7.8	7.6-8.0
1	7.7-8.0	8.5	8.3-8.6	95	7.8-8.1	7.9	7.7-8.0
30	7.5-7.7	8.6	8.5-8.6	130	7.9-8.1	7.8	7.6-8.0
100	7.2	8.5	-	220	7.7	6.8	-
Pacific Woodtreating III							
Lake Superior	7.9-8.1	9.0	8.9-9.1	95	7.4-8.0	8.0	7.7-8-3
1	7.9-8.0	8.6	-	95	7.5-8.1	8.2	8.0-8.3
30	7.7	8.8	-	145	7.8-8.1	8.0	7.8-8.1
100	7.5	9.9	-	210	7.8	7.7	-
Chambers Creek STP							
Diluted Mineral Water	7.5-7.8	8.4	8.3-8.5	88	7.4-7.7	8.2	-
1	7.5-7.8	8.3	8.3-8.5	92	7.4-7.8	8.2	8.2-8.3
30	7.2-7.4	8.8	8.8-8.9	185	7.7-7.9	8.2	8.0-8.3
100	7.0-7.3	8.8	8.5-9.0	470	7.9-8.2	8.1	8.0-8.2
Treetop Cashmere							
Diluted Mineral Water	7.7-7.8	8.4	8.2-8.5	83	7.6-7.9	7.7	7.4-8.0
1	7.7-7.8	8.4	8.2-8.5	95	7.6-7.9	7.8	7.5-8.0
30	7.7-7.9	8.4	8.3-8.5	348	7.9-8.1	7.4	7.1-7.7
100	7.6-7.9	8.9	8.9	1000	8.4	6.4	6.1-6.6

Table 5.

Mean number of young per female and percent survival for Ceriodaphnia dubia after seven days exposure to Chambers Creek POTW Effluent.

Percent Sample	Mean Number of Young per Female	95 Percent Confidence Interval	Seven Day Percent Survival
Control	20.6	15.1-26.0	90
1	18.4	14.3-22.5	100
3	11.5*	7.2-15.8	100
10	13.8	10.3-17.3	100
30	18.1	15.4-20.8	100
100	21.3	18.0-24.6	90

*Significantly lower than the control value at $P \leq 0.05$.